

PERCEIVED DISCRIMINATION AND RACIAL HEALTH DISPARITIES:  
THE ASSOCIATION OF RACE, HEALTH CARE COVERAGE AND GENERAL  
HEALTH ON PERCEPTION OF DISCRIMINATION

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# **Abstract**

Prior research acknowledges that racial health disparities are a challenge faced in public health. While the association between race, discrimination and health outcomes has been evaluated, this study explored perceived race-based discrimination and its association with health care coverage and self-evaluated general health. Multivariable logistic regression was conducted to examine if race, health care coverage status, and general health impact perceptions of an individual's health care experience adjusting for age, gender, income, education attainment, and state. Analyses found that race - specifically self-identifying as Black, proved as a significant indicator for perceived discrimination while having poor general health and lacking health insurance coverage were both associated with increased odds and strong statistical relation to perceived discrimination regardless of race/ethnicity. Evidence from this research suggests that race and behavioral risk factors influence perceived bias and may further substantiate causal effects of racial health disparities.

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# 1. Introduction

In the United States, the statistics on health disparities between socially disadvantaged and socially privileged populations, is alarming. Granted that the diversity of the American population is one of the nation's greatest assets, one of the greatest challenges in the public health community is to reduce the striking health disparities between groups of people who have different levels of underlying social advantage or privilege, i.e., wealth, education level, ethnic majorities, relative to other disadvantaged groups; including ethnic minorities, low-income, and other underserved populations.<sup>1</sup> "Social inequities" or disadvantages occur when a person is treated unfairly because of any characteristics that make individuals different such as their age, race, socio-economic class, gender or sexual orientation.<sup>2</sup> Institutions like schools, or health care facilities have the opportunity to create systematic unequal opportunities based on social status. These unequal opportunities or social inequities can lead to poor educational outcomes, create disadvantaged economic stature, and lend to health disparities for socially disadvantaged groups. "Health disparities" are defined as differences in health that are avoidable, unfair, and unjust as a result of economic, environmental and social conditions.<sup>3</sup> Such conditions can affect health in a number of ways creating health inequities between social groups. Evidence of health disparities between social groups

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<sup>1</sup> A.M Pollack and D. P Rice, "Monitoring health care in the United States—a challenging task," *Public Health Rep.* 112, no.3 (1997):108–113.

<sup>2</sup> N Krieger et al., "Racism, sexism, and social class: implications for studies of health, disease, and well-being," *Am J Prev Med.* no. 9(1993.):82–122.

<sup>3</sup> O. Carter-Pokras and C. Baquet, "What is a 'health disparity'?" *Public Health Reports* 117, no. 5 (2002.) 426–434.

resulting from social inequities is ubiquitous in prior research. Whether reporting an increased prevalence of developing dementia in abused elders or associating increased drug use with transgender persons who are denied health care, vast amounts of research show statistically significant associations between social disadvantage and health disparities.<sup>4, 5</sup>

Social disadvantage and poor health outcomes have been well-studied. Researchers often focus on the health issues of racial minorities and the difficulties they face in receiving care. For instance, medical practitioner discrimination has been identified as a source of worsened health outcomes for ethnic minorities.<sup>6</sup> This study seeks to add value to the knowledge base on the association of social inequities with health disparities by exploring self-identified race as a social determinant for differences in health outcomes. Understanding the role that self-identified race plays in health inequalities is imperative to address as the U.S Census Bureau estimates that the population of racial and ethnic minorities is predicted to comprise half of the U.S population in three decades.<sup>7</sup> Awareness of the association between ethnic minority groups and negative health outcomes is not only a concern for certain racial groups, but has important public health implications for Americans as a whole. As detailed in the

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<sup>4</sup> Andrew Coyne, William E. Reichman, and Lisa J. Berbig. "The relationship between dementia and elder abuse". *The American Journal of Psychiatry* 150, no.4 (1993): 643.

<sup>5</sup> Tarynn M. Witten, "Transgender bodies, identities, and healthcare: Effects of perceived and actual violence and abuse," *Inequalities and Disparities in Health Care and Health: Concerns of Patients, Providers and Insurers*, (2007) 225-249

<sup>6</sup> Ana I. Balsa and Thomas G McGuire, "Prejudice, clinical uncertainty and stereotyping as sources of health disparities," *Journal of Health Economics* 22, no.1 (2003):89-116.

<sup>7</sup> United States Census Bureau. December 12, 2012.  
<https://www.census.gov/newsroom/releases/archives/population/cb12-243.html> (Accessed July 7, 2017).

literature, racial status matters for an individual's health and in consequence of systematic differentiators such as racism and racial discrimination, race maintains as a predictor for disparate health outcomes.

There is relevant research on the association between race, discrimination and health outcomes, however, few studies have focused on social inequities that drive an individual's perception of discrimination in a health care setting. The body of work presented in this research aims to explore the prevalence of race-based discrimination encountered in health care settings and its association with race, health care coverage status, and self-evaluated general health. The present line of research will continue to explore social determinates that predict racial health disparities by quantifying the relationship of self-identified race/ethnicity with individual perception of health care experience compared to other race groups. This research will also examine how factors, namely healthcare coverage and general health status impact likelihood of social inequities; identified as racially perceived discrimination.

Using the 2013 Behavioral Risk Factor Surveillance System (BRFSS) survey the present work provides evidence that race - specifically self-identifying as Black, continues to shape perception of discriminatory treatment while having poor general health and lacking health insurance coverage were both associated with strong statistical relation to perceived discrimination regardless of race/ethnicity group. The current work indicates that self-identified race, healthcare coverage and general health status influence an individual's perception of encountering discrimination. This work also adds quantifiable value to the exploration of social disadvantage and its impact on health disparities in public health.

## 2. Literary Review

### *2.1 Racial health disparities and healthcare experience*

Research to date has shown that health disparities impact socially disadvantaged groups within the population such that there are known systematic differences in the way members of these groups experience greater obstacles in gaining access to and using health care. Studies suggest that education, socio-economic status, and race are sources of social disadvantage that can increase risk for negative health outcomes for socially disadvantaged groups.<sup>8</sup> Prior research acknowledges that racial health disparities is a challenge faced in public health and that its implications create intractable problems of social inequality.

The purpose of this literature review is to selectively examine dimensions that impact health disparities in minorities. Specifically, the goal is to critically review literature on racial health disparities and evaluate studies that explore racism and implicit physician bias - both of which are considered systematic determinates for negative health outcomes in minorities.

### *2.2 Health Disparities*

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<sup>8</sup> Paula Braveman and Sofia Gruskin, "Defining equity in health," *Journal of epidemiology and community health* 57, no.4 (2003): 254-258.

Research on health disparities has occurred since the 18<sup>th</sup> century, originating in European epidemiological studies. The earliest reported research examined the association between frequent breast cancer incidents in Catholic nuns and environmental risk factors.<sup>9</sup> Throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries the study of social class and environmental differences in health status continued across Europe spawning the scientific evaluation of health outcomes to defined populations in the United States.<sup>10</sup> As awareness to health disparities in the United States grew, the US Department of Health and Human services became a central proponent in the study of health disparities issuing a report “Health, United States, 1983” which detailed the health of the nation.<sup>11</sup> This report highlighted that although the overall health of the nation had improved over the past century, major disparities in health outcomes existed in minorities when compared to the nation as a whole. Subsequent to this report, in 1985 the National Institutes of Health (NIH) substantiated the racial health disparities notion in their landmark “Report of the Secretary’s Task Force on Black and Minority Health”.<sup>12</sup> Since that publication, interest in the determinants of minority health has grown considerably. Vast amounts of research have been conducted to explore the phenomenon of the effects of race on health disparities, however, despite this research and an overall improvement in the health of the

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<sup>9</sup> Paula Trahan Rieger, "Cancer and the Environment: Gene-environment Interaction," *Oncology Nursing Forum* 31, no.3 (2004): 647-648.

<sup>10</sup> Donald Acheson and D. Barker, "Independent inquiry into inequalities in health: report." (1998).

<sup>11</sup> National Center for Health Statistics (US), “Health, United States, 1983: And Prevention Profile,” *U.S. Dept. of Health and Human Services, Public Health Service, National Center for Health Statistics* (1983).

<sup>12</sup> Margaret Heckler, "Report of the Secretary's task force on Black & minority health." (1985).



nation, racial groups in America continue to experience striking health disparities.<sup>13</sup>

Although academic literature exists that critically assesses, refutes racial bias in health status, or makes claims that these disparities have deteriorated a large body of empirical research suggests that minorities indeed have inequality in their health outcomes and as such, reducing racial health disparities continues to be a major initiative of the public health establishment.<sup>14</sup>

Does race truly impact health disparities? Bach et. al. drew attention to the implications of race and health outcomes through a calculation between race and the treatment of early-stage non-small cell lung cancer.<sup>15</sup> In this study White and Black subjects 65 and older were selected based on the criteria of having stage I or stage II non-small-cell lung diagnosis between 1985 and 1993 and prior to the age of 65 years. To determine the difference in rate of surgical treatment between these racial groups and rates of survival, controlling for coexisting illness, socioeconomic status, insurance coverage, and availability of care, researchers identified a cohort of 10,984 patients; 860 (8 percent) black, and 10,124 (92 percent) non-Hispanic white, who were stratified into one group containing patients who resided in areas in the lowest quartile of median income, and another group containing all other patients. Using statistical analysis to control for confounding affects, results found that black patients were 12.7 percentage

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<sup>13</sup> Gregory Pappas et al., "The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986," *New England journal of medicine* 329, no. 2 (1993): 103-109.

<sup>14</sup>Michael W. Byrd and Linda A. Clayton, "An American Health Dilemma, Volume 1: The Medical History of African Americans and the Problem of Race: Beginnings to 1900." (2000). P. Reid, B. Robson, and C. P. Jones. "Disparities in health: common myths and uncommon truths." *Pacific health dialog* 7, no. 1 (2000): 38-47.

<sup>15</sup> Peter B. Bach et al., "Racial differences in the treatment of early-stage lung cancer," *New England Journal of Medicine* 341, no. 16 (1999): 1198-1205.

point less likely than white patients to undergo surgical treatment. Both unadjusted and adjusted analyses showed that black patients had a five-year survival rate similar to that of white patients. However, after diagramming the effect of the results in a hypothetical cohort of 1000 white patients and 1000 black patients, only 264 patients were alive at five years – 77 (7.7 percent) fewer than the white cohort. Researchers were able to estimate that of the 77 more deaths per 1000 black patients, the majority (44) could be attributed to the lack of surgical treatment indicating racial inequality in mortality.

Breast Cancer is another type of cancer found to have racially disparate outcomes. Breast cancer does not fit the general pattern as minorities actually have lower rates of new breast cancer rates in a given year when compared to white women. However, although they are less likely to get the disease, in general, black women are more likely to have a higher rate of breast cancer incidence under the age of 40 years old documenting the fact that when this population gets the disease they are dramatically more likely to get it at a young age.<sup>16</sup> Other research suggests that for African American and Latinos collectively, once they have an onset of breast cancer the outcome course of the disease is worse when compared to white women indicating that although they are less likely to get the disease, they are more likely to die from it in a given year.<sup>17</sup> Hershman et. al, examined Black and White women who were diagnosed with stage I/II breast cancer between January 1, 1996, and December 31, 2001 and received adjuvant chemotherapy.<sup>18</sup>

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<sup>16</sup> J. Eley et al. "Racial differences in survival from breast cancer: results of the National Cancer Institute Black/White Cancer Survival Study," *Jama* 272, no. 12 (1994): 947-954.

<sup>17</sup> *Ibid.*, 947-954.

<sup>18</sup> Dawn Hershman et al., "Racial disparities in treatment and survival among women with early-stage breast cancer," *Journal of Clinical Oncology* 23, no. 27 (2005): 6639-6646.

Using Cox proportional hazards models, 472 eligible patients analyzed to determine the causal effects of early treatment termination and treatment duration on all-cause mortality. Among the cohort of 472 women diagnosed from 1996 to 2001 only 68% of black patients, compared to 76% of white patients, completed all prescribed cycles of adjuvant chemotherapy ( $P = .03$ ). Of the 344 patients who completed 100% of the number of adjuvant chemotherapy cycles, 89% were alive 5 years after diagnosis; of the 120 who did not complete treatment, only 74% survived for 5 years ( $P = .03$ ). Of 270 white patients, 93% were alive 5 years after diagnosis, and of 202 black patients, 81% were alive 5 years after diagnosis. This study concluded that there was an overall increased mortality rate in women who discontinued chemotherapy treatment prior to completion than there was for those who completed. Black women, however, terminated treatment prematurely at much higher rates and were twice as likely to die as white women.

Although this research centered on racial health disparities in cancer, numerous studies can be found that empirically test the association of race and other diseases. Literature shows that the consistent inequity of health outcomes between minorities and whites is perceived throughout chronic health conditions. Diseases such as depression, hypertension, and cardiovascular disease all have worse outcomes within the minority population while the disparities of disease are persistent over time.<sup>19</sup> In the United States and globally, racial status matters for an individual's health. Race predicts consequences in virtually every domain of American life and significantly correlate to health outcomes.

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<sup>19</sup> Richard Cooper et al., "Trends and disparities in coronary heart disease, stroke, and other cardiovascular diseases in the United States," *Circulation* 102, no. 25 (2000): 3137-3147.

It is no wonder then why race is commonly used in public health research. But why is race so important? Understanding race and its tie to the system of racism in the United States gives better perspective on how it relates to the bias seen in health outcomes.

### *2.3 The systematic differentiator of racism and implicit bias*

Racism, one source of systematic differentiation that contributes to health disparities, is rooted in a historical and contemporary system of structuring opportunity and assigning value based on socially assigned race.<sup>20</sup> Personal experiences of institutional racism is an added pathogenic factor that can affect the health of minorities. There is a robust body of scientific evidence suggesting that there are multiple mechanisms by which racism affects health.<sup>21, 22</sup> The system of racism has subjected minorities to historically receive less quality health care than non-minorities and transversely allowed non-minorities to benefit from better health care.<sup>23</sup> The system of racism then unfairly disadvantages or advantages individuals and communities.<sup>24</sup> Moreover, although race does not capture biological distinctiveness the categories of race are linked to broader social and political issues.<sup>25</sup> Jones et. al drew attention to the

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<sup>20</sup> Camara Phyllis Jones, "Levels of racism: a theoretic framework and a gardener's tale," *American journal of public health* 90, no. 8 (2000): 1212.

<sup>21</sup> Yin Paradies, "A systematic review of empirical research on self-reported racism and health," *International journal of epidemiology* 35, no. 4 (2006): 888-901. David R. Williams, "Race, socioeconomic status, and health the added effects of racism and discrimination," *Annals of the New York Academy of Sciences* 896, no. 1 (1999): 173-188

<sup>22</sup> David R. Williams, and Chiquita Collins, "Racial residential segregation: a fundamental cause of racial disparities in health," *Public health reports* 116, no. 5 (2001): 404-416.

<sup>23</sup> Jones, "Levels of racism," 1212.

<sup>24</sup> Williams and Collins, "Racial residential segregation," 404-416.

<sup>25</sup> Neil Risch, Esteban Burchard, Elad Ziv, and Hua Tang, "Categorization of humans in biomedical research: genes, race and disease," *Genome biology* 3, no. 7 (2002): 2007-1.

influence of racism on health disparities through the evaluation of socially assigned race with self-identified race and health status.<sup>26</sup> Using the Reactions to Race module from BRFSS, Jones posited that *race* is a predictor of health outcomes because of racism. Using logistic regression models, findings on 34,775 U.S respondents 18 years and older concluded that being classified by others as White is associated with a larger significant health advantages than minorities. While 58.6 percent of socially assigned White respondents reported excellent or very good health, 44.4 percent of Black and 39.8 percent of Hispanics reported equivalent health status.

Understanding that there is known systematic racial bias that impacts health disparities among minorities and evaluating causal effects of such disparities is important. Research shows that some of the effects of racial health disparities is rooted in bias while historical content demonstrates the mistreatment and exploitation of minorities in healthcare. Racial bias or discrimination refers to members of one group being treated in a way that is inferior or less desirable than members of another group.<sup>27</sup> Examples of racial discrimination in biomedicine and healthcare is evident. In 1932 African American men were unknowingly subjected to syphilis as part of the U.S Public Health Service Tuskegee Syphilis Study on Untreated Syphilis in the Negro Male.<sup>28</sup> In 1951, cells from Henrietta Lacks, a 31 year old African American, were taken without her consent or for

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<sup>26</sup> Camara Phyllis Jones et al., "Using Socially Assigned Race in Health Status," *Ethnicity & disease* 18, (2008): 496.

<sup>27</sup> Leslie Hausmann et al., "Perceived discrimination in health care and health status in a racially diverse sample," *Medical care* 46, no. 9 (2008): 905.

<sup>28</sup> Vanessa Northington Gamble, "Under the shadow of Tuskegee: African Americans and health care," *American journal of public health* 87, no. 11 (1997): 1773-1778.

compensation and used as a lucrative research tool in biomedicine.<sup>29</sup> The residual effects of racial discrimination on minorities is evident. African Americans are still distrustful of physicians and medical researchers and as a result, less likely to participate in clinical trials or receive medical care.<sup>30</sup> Similar research found that 44 percent of African-Americans reported low trust in health care providers compared to one-third of white patients. Those individuals with fewer positive interactions with physicians, and who primarily used emergency rooms and hospitals for their care, were more likely to report mistrust.<sup>31</sup>

Hoffman et. al also explored ethnic discrimination in their study to examine racial bias in pain assessment and treatment recommendations.<sup>32</sup> A large cohort of White, native English speaking medical students and residents who were born in the United States were surveyed to review mock medical cases of a black and white patient and rate their level of pain and provide a medication recommendation. The cohort also completed measures of false beliefs; the extent to which 15 biological differences, true or untrue, exist between blacks and whites. Analysis using continuous measures of false beliefs revealed that approximately 50 percent of the sample endorsed at least one of the false beliefs. Using regression analysis of pain ratings on race and false beliefs, adjusting

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<sup>29</sup> Rebecca Skloot, *The immortal life of Henrietta Lacks* (New York, NY: Broadway Books, 2011).

<sup>30</sup> Vickie L. Shavers, et al. "Racial differences in factors that influence the willingness to participate in medical research studies," *Annals of epidemiology* 12, no. 4 (2002): 248-256.

<sup>31</sup> David H. Thomas, Mark A. Hall and L. Gregory Pawlson. "Measuring patients' trust in physicians when assessing quality of care," *Health affairs* 23, no. 4 (2004): 124-132.

<sup>32</sup> Kelly M Hoffman et al., "Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites," *Proceedings of the National Academy of Sciences* (2016): 221-247.

for age, gender, and medical cohort (first year, second year, third year, and residency) results revealed that false beliefs are related to racial bias in pain perception as the sampled population who endorsed false beliefs showed bias in the accuracy of their pain treatment recommendations. As with pain bias, elevated levels of perceived discrimination also predict poor sleep, coronary artery calcification, high blood pressure, and numerous other chronic diseases in minorities.<sup>33</sup> Discrimination is a major factor that impacts health outcomes for minorities within our society and evidence in the literature makes it very clear that effective strategies to reduce inequalities in health must address fundamental non-medical determinants.

Despite the aforementioned lines of research on the association between race, discrimination and health outcomes, few studies have focused on perceived race-based discrimination and its association with health care coverage and self-reported general health. The present line of research seeks to accomplish two overarching aims. First, it further explores racial differences in health care outcomes by quantifying the relationship of self-identified race/ethnicity with an individual's perception of their health care experiences. Second, this study will also examine how factors such as healthcare coverage and overall health impact these perceptions. More specifically the following question will be explored empirically: Is the prevalence of perceived racial discrimination in health care settings associated with race, health care coverage status, and self-reported general health?

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<sup>33</sup> Tené T Lewis et al., "Chronic exposure to everyday discrimination and coronary artery calcification in African-American women: the SWAN Heart Study," *Psychosomatic medicine* 68, no. 3 (2006): 362-368.

Natalie Slopen, Tené T. Lewis, and David R. Williams. "Discrimination and sleep: a systematic review," *Sleep medicine* 18 (2016): 88-95.

## 3. Data and Methods

### *3.1 Behavioral Risk Factor Surveillance System*

The Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System is the United States system of collecting health data on U.S. residents, aged 18 and older, through a random digit-dialed telephone sample frame.<sup>34</sup> The BRFSS collects information on health status, risk behaviors, use of preventive services, and chronic conditions for randomly selected individuals per household in all 50 states and the District of Columbia using a complex sampling design. Specifics on the purpose, survey design, and limitations of the BRFSS can be found elsewhere.<sup>35</sup> This research utilized 2013 annual BRFSS data.

### *3.2 Study Measures: Perceived Discrimination*

In addition to core health, risk behavior, and preventive service questions asked annually in all states, BRFSS administers optional modules from which individual states can choose. The Reactions to Race module is a six-question optional module evaluating socially assigned race (“How do other people usually classify you in this country?”) and race consciousness (“How often do you think about your race?”), as well as perceptions

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<sup>34</sup> Centers for Disease Control and Prevention. August 26, 2016 <https://www.cdc.gov/brfss/> (Accessed June 4, 2017).

<sup>35</sup> S. Sean Hu et al., “Improving Public Health Surveillance Using a Dual-Frame Survey of Landline and Cell Phone Numbers,” *American Journal of Epidemiology* 173, no. 6 (2011) 703–711. <https://doi.org/10.1093/aje/kwq442>



of differential treatment at work, when seeking health care, and reports of emotional upset and physical symptoms as a result of race-based treatment.<sup>36</sup> Details on the objectives, design and cognitive testing of the Reactions to Race model have been previously published.<sup>37</sup> This article presents data on the 2013 BRFSS and Reaction to Race module from the states Alabama (N=6503) and Arizona (N=4252); the only states to survey respondents on the core BRFSS and Reaction to Race module in 2013.

The primary dependent variable of interest for this research includes perceived racial discrimination while seeking health care and was assessed with the following survey question: “Within the past 12 months when seeking health care, do you feel your experiences were worse than, the same as, or better than people of other races?” Responses were recorded as “1 =Worse than other races; 2 =The same as other races; 3=Better than other races; 4=Worse than some races, better than others; 5=Only encountered people of the same race; or 6=No health care in past 12 months.” Categories 5 and 6 were excluded from analyses because relatively few people chose these responses (0.6% and 0.8% each) and they did not unambiguously indicate the presence or absence of discrimination. Responses were combined into dichotomous categories. Responses from “Worse than other races” and “Worse than some races, better than others “ were coded as having experienced discrimination while responses from “The same as other races” or “Better than other races” were coded as not having experienced discrimination.

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<sup>36</sup> Camara Phyllis Jones, "Levels of racism: a theoretic framework and a gardener's tale," *American journal of public health* 90, no. 8 (2000): 1212.

<sup>37</sup> Behavioral Risk Factor Surveillance System. “Reactions to race module,” 2002 BRFSS questionnaire. <http://apps.nccd.cdc.gov/> (Accessed August 2, 2017)

### *3.3 Study Measures: Race, Healthcare coverage, General Health*

The main independent variables of interest were self-identified race, health care coverage, and general health status for respondents reporting discrimination (Table 1). The self-identified race variable used in this research was derived using two core BRFSS questions indicating race/ethnicity: “Which one or more of the following would you say is your race?” and “Are you Hispanic, Latino/a, or Spanish origin?”. If respondents responded as identifying with any of the categories from the “Are you Hispanic, Latino/a, or Spanish origin?” question, the race/ethnicity was designated as Hispanic regardless of the prior race/ethnicity question. If respondents did not identify with any of the categories from the “Are you Hispanic, Latino/a, or Spanish origin?” question, race/ethnicity from the prior question was used. The derived self-identified race was coded as: 1 = White, Non-Hispanic, 2 = Black, Non-Hispanic, 3 = Asian, Non-Hispanic, 4 = American Indian/Alaskan Native, Non-Hispanic, 5 = Hispanic, and 6 = Other race, Non-Hispanic. Subsequent to pooling respondent data from Alabama and Arizona, given the relatively small percentage of respondents in the Asian, Non-Hispanic and American Indian/Alaskan Native race groups (2.5% and 2.9%, respectively) and the difficulty of drawing conclusions about them due to their heterogeneous nature, the analyses for these race groups were collapsed into the Other race, Non-Hispanic category (1.5%) to generate a larger combined population (6.9%). Therefore this research focused on three of the largest race groups in the United States - Non-Hispanic Whites, Non-Hispanic African Americans, and Hispanic Americans.

The BRFSS core survey ascertains health care coverage status by asking the question: “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?” Responses were categorized as: 1=Yes, and 2=No while response categories from 7=Don’t Know/Not Sure, and 9=Refused were recoded as missing to not impact the overall analysis. Individuals who reported as not having insurance coverage at the time of the survey, were considered to be uninsured.

General health status was determined using the self-rated health status from the BRFSS core survey. Individuals were asked the question “Would you say that in general your health is: 1=Excellent, 2=Very Good, 3=Good, 4=Fair, or 5=Poor?”. Responses of Excellent and Very Good health status were combined to indicate optimal health while other response categories Good, Fair and Poor remained separate to measure less than optimal health.

The respondent sample was categorized by demographic characteristics including age, race/ethnicity, annual household income, gender, and highest educational attainment.

### *3.4 Statistical Analysis*

Analysis were organized to evaluate causality of perceived discrimination when seeking health care treatment. Since the BRFSS utilizes a complex survey design, SAS SURVEY procedures were utilized to include the strata, cluster, and weight statements to assure an appropriate analysis (cite). Post stratification state-level data weights, adjusting

for probability of selection and nonresponse, were included in all analyses.<sup>38</sup> Due to limitations in the weighted sample size for Alabama, the research presents pooled analysis from Alabama and Arizona. Combining states produced a more sufficient populated stratum and allowed for proper calculation of the variance for the strata. To test for state level differences in self-reported discrimination, a dummy coded predictor indicating the state in which the respondent resides was included in the model. Respondent characteristics (age, sex, annual household income, level of education) were summarized by each race/ethnicity group. To measure the strength of relationships and reduce multicollinearity in the logistic regression model, correlation analysis was assessed on each independent variable prior to model inclusion.

By fitting a logistic model that accounts for the complex survey design of BRFSS, this research intends to predict the probability that a person perceives discrimination based on an individual's self-identified race/ethnicity, healthcare coverage status, and general health. Bivariate logistic analysis was conducted to explore the association between each respondent characteristic and perceived discrimination (dichotomized as "experienced discrimination" vs. "did not experience discrimination").

A multiple variable logistic regression model was specified to predict the odds that a respondent will report perceived discrimination based on predictor variables. Comparisons of perceived discrimination between the predictors (race/ethnicity, healthcare coverage status, and general health) were adjusted by respondent characteristics. The PARAM=GLM options was used in the multivariable logistic model

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<sup>38</sup> Michael P. Battaglia, Martin R. Frankel and Michael W. Link, "Improving Standard Poststratification Techniques For Random-Digit-Dialing Telephone Surveys," *Survey Research Methods* 2, no.1 (2008) 11-19.

to produce LSMEANS and odds ratio estimates. Model comparisons were evaluated using the anova function in R (Survey Package) while SAS version 8.2 was used for all other analysis. For this study, the alpha level of 0.05 is used for significance testing.

## **4. Findings and Results**

### *4.1 Reactions to Race 2013 Sample Characteristics*

Demographic characteristics of the sample included in the 2013 Reaction to Race module are summarized in Table 1. The majority of respondents in the sample were Whites (64.3%) and Hispanics (22.6%) while respondents in the racial groups Black (6.0%), and Other Race (6.9%) were significantly less. Men and women were roughly equally represented in the sample across all racial groups, however, Whites, Blacks and the Other Race category had slightly more females when compared to Hispanics. Whites tended to be older than respondents in other race groups, while Blacks primarily comprised the 35-44 age group, and Hispanics were dispersed evenly across age groups with the exception of 65 or older where they represented 1.6% of that age category. Within the random sample, all racial groups had lower attainment of income and education compared to Whites, and the majority of respondents in all racial groups reported having graduated from high school.

The majority of respondents in all racial groups also reported having health insurance, but this was most often the case for Whites (55.9%) followed by Hispanics (15.3%), and Other Race (6.3%). Of respondents who self-identified their race as Black, approximately 5% reported having health insurance. When assessing general health, the majority of respondents indicated having “good” health, however, 43.2% of

Whites reported having good health when compared to only 13% of Hispanics and 3.5% of Blacks.

**Table 1. Baseline Demographic Characteristics of Each Racial Group**

	White	Black	Hispanic	Other	Total
Unweighted n	2416	177	387	236	3216
Weighted n	2116748	200368	744114	230273	3291503
Variables	Column Percent Based on Weighted data				
Perceived Discrimination					
Worse	1.3	0.4	0.3	0.2	2.3
Same	62.9	5.7	22.2	6.7	97.7
Sex					
Female	1.3	0.6	1.0	0.7	47.8
Male	1.4	0.5	1.5	0.4	52.2
Age					
18-24	6.5	0.8	4.7	1.2	13.3
25-34	7.3	0.4	4.7	1.8	14.4
35-44	10.3	1.9	4.5	0.9	17.8
45-54	11.6	1.0	3.4	1.4	17.5
55-64	11.7	0.8	3.5	0.8	16.9
65 or older	16.6	1.0	1.6	0.6	19.8
Income					
< \$15K	5.2	0.9	4.9	1.2	12.2
\$15K - \$25K	9.2	1.1	6.9	0.9	18.1
\$25K - \$35K	7.9	0.6	2.8	1.7	13.3
\$35K - \$50K	9.8	1.0	3.2	0.6	14.7
> \$50K	32.4	2.3	4.7	2.1	41.5
Education					
Less than HS	0.9	0.1	4.2	0.3	5.6
HS Graduate	20.3	2.5	9.7	3.1	35.7
Some College	24.3	2.0	6.2	2.1	34.7
College Grad	18.7	1.5	2.4	1.4	24.0
Health Insurance					
Yes	55.9	4.8	15.3	6.3	82.4
No	8.3	1.3	7.2	0.7	17.6
General Health					
Excellent	11.5	1.1	4.1	1.4	18.2
Good	43.2	3.5	13.5	4.7	65.0
Fair	6.3	1.0	3.8	0.5	11.7
Poor	3.3	0.3	1.2	0.3	5.1

Note: The demographic characteristics reflect pooled data from Alabama and Arizona using the BRFSS 2013 Reactions to Race module.

#### *4.2 Perceived Discrimination in Health Care: Logistic Modeling*

Table 2 presents the results for Alabama and Arizona from a bivariate logistic regression model assessing the relationship between perceived discrimination in a health care setting and respondent characteristics with odds ratios (ORs). Using Whites as the reference group, the percentage of respondents reporting perceived discrimination (i.e., feeling that when seeking health care, their experience was worse than people of other races) was moderately significant for Blacks ( $p=.005$ ) indicating that this racial group is approximately 3 times more likely to experience perceived discrimination than Whites. The Other Race category followed with 1.7 times the odds of experiencing perceived discrimination when compared to Whites. Females were 1.3 times as often as males to report perceived discrimination and respondents in the 55-64 age category were over 3 times more likely than respondents 65 years or older to perceive discrimination, however these respondent characteristics were not statistically different.

Perceived discrimination in a health care setting was significantly related to other respondent characteristics in the unadjusted model. The difference in prevalence between respondents earning \$25K - \$35K and >\$50K were statistically different from respondents earning less than \$15K while high school graduates, and those with some college education, were 8 times more likely to report perceived discrimination ( $p=0.04$ ). Finally, respondents not having health care coverage and those self-reporting as having poor health status were both highly statistically associated to discrimination ( $p < 0.0001$ ) in the unadjusted model.

#### *Multiple Logistic Model*

A multiple variable logistic regression model was specified using perceived discrimination as the outcome variable to predict the odds that a respondent will have a

perception of bias based on predictor variables. Adjusted odds ratios from this model found in Table 2, reflect the relationship between perceived discrimination, race, health status, and health insurance adjusting for all other variables including age, gender, income level and education attainment. Using 0.05 as the alpha level for significance testing, overall, racial groups were statistically significant in the unadjusted model, and also in the adjusted model after controlling for sex, race, age, income, education level, general health status and health care coverage. Moreover, after adjusting for respondent characteristics, Blacks perceived discrimination approximately 3 times as often as Whites ( $p=0.01$ ,  $OR=2.9$ ), while respondents identifying as Other also reported an increased odds of experiencing discrimination ( $p=0.02$ ,  $OR=2.7$ ).

Results also indicate that after adjustment, respondents in the middle education categories were over 8 times as often to report discrimination (vs. less than high school) while the effect for lacking health insurance coverage ( $p=0.004$ ) and poor general health ( $p<0.0001$ ) were both statistically significant. After adjustment, respondents with poor general health perceived discrimination in health care approximately 10 times as often as individuals with self-reported excellent health. Lastly, significance was not found on the dummy variable for state in the model indicating that perceived discrimination is not influenced by geographic region.

**Table 2. Unadjusted and Adjusted Odds Ratio of Perceived Discrimination while receiving health care**

Variable	Weighted Percentage	Unadjusted OR*	Adjusted OR**
Race			
White	1.3	Reference Group	Reference Group
Black	0.4	3.1***	2.9***
Hispanic	0.3	0.7	0.8
Other	0.2	1.7	2.7***
Sex			
Female	1.4	1.3	1.2



Male	0.9	Reference Group	Reference Group
Age			
18-24	0.1	Reference Group	Reference Group
25-34	0.4	2.5	1.7
35-44	0.3	1.7	1.1
45-54	0.5	2.8	1.4
55-64	0.7	3.6	2.0
65 or older	0.2	1.1	1.1
Income			
< \$15K	0.7	Reference Group	Reference Group
\$15K - \$25K	0.4	0.4	0.4
\$25K - \$35K	0.2	0.2***	0.3***
\$35K - \$50K	0.4	0.5	0.8
> \$50K	0.5	0.2***	0.5
Education			
Less than HS	0.1	Reference Group	Reference Group
HS Graduate	1.0	8.1	7.6
Some College	0.9	7.8	9.0
College Grad	0.3	3.2	4.3
Health Insurance			
Yes	1.3	Reference Group	Reference Group
No	1.0	2.6***	2.9***
General Health			
Excellent	0.2	Reference Group	Reference Group
Good	1.5	2.5	3.6
Fair	0.2	2.2	2.1
Poor	0.3	7.7***	9.5***
State			
Alabama	0.4	Reference Group	Reference Group
Arizona	1.9	0.2	0.2

\*Unadjusted ORs indicate the crude bivariate relationships between perceived discrimination and each variable. \*\*Adjusted ORs indicate the relationship between perceived discrimination and each variable, adjusting for all other variables. Individual coefficients are statistically significant at the \*\*\* $p \leq 0.05$  level.

### 4.3 Goodness of Fit

The contribution of individual predictors to model fit was assessed through a series of likelihood ratio tests (Table 3). A fully saturated model containing all predictors was compared to a nested model with one fewer predictor. Using the alpha level of 0.05, comparing the full model to one in which health insurance status was removed suggested that inclusion of health insurance status as a predictor of perceived bias in the model contributed significantly to the overall fit of the model. Similarly, inclusion of health status was also found to significantly improve model fit. Educational attainment was found to marginally impact model fit.

**Table 3. Summary of likelihood ratio tests.**

Model Comparison	2logLR	Degree of Freedom	p
Full vs - State	9.07	1	0.17
Full vs - Age Group	6.23	5	0.28
Full vs - Sex	1.35	1	0.25
Full vs - Race	9.23	5	0.12
Full vs - Education	6.29	3	0.10
Full vs - Health Status	11.27	3	0.01
Full vs - Insurance Status	13.17	1	< 0.001

Note: The full model refers to a fully saturated model in which all 7 predictors were simultaneously included in the model; the minus (-) symbol indicates that the predictor has been removed from the comparison model.

## 5. Discussion

The purpose of this study was to explore whether self-identified race, having health care coverage, and general health status are associated with perceived discrimination in a health care setting. In summary, the analysis suggests that the effects of being a minority, lacking health care coverage, and having poor general health are predictors of increased prevalence for perceived discrimination after adjusting for all other variables in the model. In addition to being adjusted for gender, the comparisons in this analysis are adjusted for age, income level, and education status which have previously been identified as social determinates that influence racial health disparities.<sup>39</sup> Overall

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<sup>39</sup>M Marmot M and R.G Wilkinson, *Social Determinants of Health* (Oxford, England: Oxford University Press; 1999).

race, and specifically self-identifying one's race as Black compared to Whites, proved as the most significant indicator when evaluating race on perceived discrimination in the adjusted analysis. Blacks reported experiencing discrimination approximately 3 times as often as Whites. The difference reported between Whites and Blacks aligns with prior research exploring the effects of race on perceived discrimination and is not surprising given the historical context of racism and minority mistreatment by medical professionals in the United States.<sup>40</sup>

Respondents identifying as Other also reported an approximate 3 times increased odds of experiencing discrimination when compared to Whites. The comparable results between self-reported race/ethnicity Other and Blacks was surprising. An explanation of this effect could contribute to the lack of sample and subsequent collapsing of race groups resulting in an inflated odds of experiencing discrimination for the Other race group. Hispanics did not prove to have an impressive increased odds of experiencing discrimination when compared to Whites. The results of this minority ethnicity group conflicted with prior research indicating that when compared to Whites, Hispanics report bias while receiving medical care at approximately the same rate of Blacks.<sup>41</sup>

Race, however, was not the only statistically significant predictor of racially perceived discrimination. After adjusting and, regardless of race/ethnicity, having poor general health and lacking health insurance coverage were both associated with an increased odds and strong statistical relation to perceived discrimination. Evidence from the analysis reflects previous research on the effects of health disparities, unrelated to

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<sup>40</sup> L. R. M Hausmann et al., "Perceived Discrimination in Health Care and Health Status in a Racially Diverse Sample," *Medical Care* 46, no.9 (2013): 905–914.

<sup>41</sup> Nancy Krieger et al., "Experiences of discrimination: Validity and reliability of a self-report measure for population health research on racism and health," *Social Science & Medicine* 61, no. 7 (2005).

race, by examining general health status and health insurance coverage on social inequities as the outcome of interest.<sup>42</sup> However, by nature of the BRFSS perceived discrimination question and its association with race, these findings corroborate and build upon research exploring causes of racial inadequacies in health.<sup>43</sup>

This study has several limitations that must be noted. First, the analysis is limited by the data to address the goals of the research. The Reactions to Race Module was completed by only two states in 2013, Arizona and Alabama. The limitation of state data represented in the sample introduced complexities in stratifying the analysis by geographic area and required pooling of the two states. Combining states produced a more sufficient populated stratum and allowed for proper calculation of the variance, however, even when using the weighted population, the data may not be a representative sample of the entire United States. As a result, the generalizability of findings should apply to those states included in the analysis. Second, although a major strength of this study is its use of data from BRFSS, a globally recognized survey, several analysis variables required collapsing for better interpretation. This study gleaned on prior research to combine excellent and very good health status as indicators for optimal health while other response categories Good, Fair and Poor remained separate to measure less than optimal health.<sup>44</sup> Combining self-rated health in this manner differs from external

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<sup>42</sup> Richard Epstein, "Disparities and Discrimination in Health Care Coverage: A Critique of the Institute of Medicine Study," *U Chicago Law & Economics*, Working Paper No. 208 (2004).

<sup>43</sup> Marsha Lillie-Blanton and Catherine Hoffman, "The Role of Health Insurance Coverage In Reducing Racial/Ethnic Disparities In Health Care," *Health Affairs* 24, no.2 (2005) 398-408.

<sup>44</sup> Jones, "Using Socially Assigned Race," 496.

research on health adversity outcomes and may have implications on optimal health interpretation.<sup>45</sup> Third, prior research discussed the limitation of the single-item measure of health care discrimination.<sup>46</sup> The interpretation of the response option “Only encountered people of the same race” and “No health care in past 12 months” did not necessarily indicate absence or presence of discrimination. These options were excluded from the analysis while determining in which category to dichotomize “The same as other races” was based on interpretation. Lastly, the analysis could have been more revealing if it were based on respondents who seek medical care on a regular basis, a question assessed in the annual BRFSS survey. Limiting the analysis to respondents who receive care regularly may have impacted the predictors for perceived discrimination while seeking health care.

Limitations of the present work offers streams of exploration for future research. Future work needs to examine the effects of racially perceived discrimination on specific negative health outcomes and understand how variation in racially perceived discrimination impact risky health behaviors that lead to racial health disparities.

This study explored the association of race, health care coverage, and self-evaluated general health with an individual’s perception of being discriminated against based on their race. Attention to the ways in which our society reduces racial discrimination is important in increasing optimal health – as those who were less likely to experience discrimination reported better general health. Effective strategies to reduce inequalities in

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<sup>45</sup> Elena M. Andresen et al., “Retest reliability of surveillance questions on health related quality of life,” *Journal of Epidemiology & Community Health* 57, no. 5 (2003): 339-343.

<sup>46</sup> Leslie R.M Hausmann et al., “Perceived discrimination in health care and health status in a racially diverse sample,” *Medical care* 46, no. 9 (2008): 905.

health must also address fundamental non-medical determinants such as health coverage. The research underscores a reason why efforts should be made to implement policies surrounding universal attainment of health care coverage for socially disadvantaged groups – as those who perceived discrimination were less likely to have health insurance. The present work also demonstrates that there is a continual need to address the systematic effects of racism on health in order to catalyze a shift towards health equality amongst all ethnic groups in the United States.

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# Curriculum Vita

## Robyn Clemons Wallace

### ***Northrop Grumman Information Systems***

*Scientific Data Analyst III, Center For Disease Control (CDC)*

*Population Health Surveillance Branch – Division of Population Health*

2012 – Present

- Develop the SAS program architecture to determine Small Area Estimation for United States population outcomes and risk factors
- Design and code statistical models to determine health status by states and county levels
- Collaborate with Epidemiologists and Statisticians to develop data standards and quality control methodologies for Sample Survey data
- Lead projects with customer in managing, designing and building custom solutions to support deliverables while ensuring customer relationships are properly achieved
- Engage with customer to develop project specific data standards and the associated business processes to support the standards

### ***Scientific Data Analyst III, Center For Disease Control (CDC)***

*Program Evaluation Branch (PEB) - Division of HIV and AIDS Prevention*

2010 – 2012

- Develop and implement data extraction, back-up and storage procedures for the Division of HIV and AIDS' Data Management team
- Manage the influx, de-encryption and dissemination of national HIV and AIDS data submitted to the Program Evaluation Branch via PEMS and EvalWeb
- Automate the identification of data outliers and trends within the national HIV and AIDS database via SAS
- Identify work flow deficiencies within projects and lead the implementation of recommended solutions

### ***Peachtree BioResearch Solutions, Inc***

*Senior Statistical Programmer (Consultant)*

2009 – 2014

- Provide statistical programming support through the creation of CDISC analysis datasets and production and validation of Tables, Figures and Listings (TFL's)
- Develop Standard Operating Procedures (SOP's) related to SAS and Biostatistics functionality
- Provide direction and guidance for all projects within the SAS Programming group

***Social and Scientific Systems, Inc***

*Programming/Data Manager (Consultant)*

2009 – 2010

- Establish data management activities on multiple pharmaceutical and university studies and facilitate the flow of data between acquisition and SAS analysis
- Analyze data specifications, formulate programming approaches, and consult with clients to clarify requirements
- Identify and develop programming modules and macros. Coded, tested, debugged, revised, and refined complex programs

***AtheroGenics, Inc***

*Associate Director of Statistics* 2008 – 2009

*Manager of SAS Programming* 2004 – 2008

*Senior Clinical Analyst* 2001-2004

- Collaborate with Directors of Statistics, Data Management, Senior Cardiologists and Clinical Research teams on project tasks including the adoption and use of clinical data standards - CDISC (ADaM) for statistical analysis, FDA submissions, ISS/ISE/DSMB prep, data integration, data transfers, project set-up, Statistical Analysis Plan design, TFL production, edit checks, SAS code development and code review
- Develop data mapping processes to transform legacy studies and integrate datasets from multiple studies allowing consistent analytics
- Develop and execute new technologies in the SAS and Biostatistics Group such as the SAS Drug Development (SDD) platform and the Statistical Analysis and Reporting System (STARS)
- Lead technology implementation team to gather and interpret project requirements and translate into specifications, develop solution design, create use cases, and perform validation

- Eliminate need to outsource programming by creating data standards across studies Phase I – Phase III. Standardization of datasets and TFLs reduced reiterative programming time by 75%
- Design, test and maintain Oracle clinical database repositories and create SAS Process Development Procedures based on 21 CFR Part 11 Guidelines

### ***Quintiles, Inc***

*Clinical Information Systems Programmer*

1999– 2001

- Collaborated with senior project statistician and programming team members to produce statistical analysis, tables, figures and listings for clinical study reports

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### ***Education***

#### ***BS in Laboratory Animal Science***

*North Carolina Agriculture and Technical University – 1998*

#### ***MS in Government Analytics***

*Johns Hopkins University – Expected August 2017*

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### ***Technical Expertise***

*SAS Products:* *BASE/STAT, Macro Language, Enterprise Guide, SAS Drug Development*

*Analysis Tools/*

*Development Languages:* *SAS, R, SQL, Java, HTML, Python, Stata, Latex, Excel*

*Database/Application Servers:* *Hadoop, Pig, Hive, ArcGIS, Oracle, Microsoft Access, Accumetrics, ClinTrial, EvalWeb,*

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### ***Publications/Achievements***

- *Pierannunzi, C., Xu, F., Wallace, R., et al. (TBD). Devising a Method for Calculation of Standard Errors in Small Area Estimation Using the BRFSS.*

- *Pierannunzi, C., Xu, F., Wallace, R., et al. (2016). A Methodological Approach to Small Area Estimation for the Behavioral Risk Factor Surveillance System. Preventing Chronic Disease, 13, <http://dx.doi.org/10.5888/pcd13.150480>*
- *2008 AtheroGenics President Council Recipient*
- *2007 AtheroGencis President Council Recipient*
- *Member of Biotech and Pharma Professionals Network*
- *Member of CDISC ADaM Advocates*
- *Member of Technology Association of Georgia (TAG)*